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Links

Biodegradable foam coating of cortical allografts.

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Clinical outcomes of bone allograft procedures may be improved by modifying the surface of the graft with an osteoconductive biopolymeric coating. In this comparative in vitro study, we evaluated the dimensional stability, mechanical strength, hydrophilicity, and water uptake of biodegradable foams of poly(propylene fumarate) (PPF) and poly(d,l-lactic-co glycolic acid) (PLGA) when applied as surface coatings to cortical bone. Cortical bone samples were divided into four groups: Type I, untreated bone; Type II, laser-perforated bone; Type III, partially demineralized bone; and Type IV, laser-perforated and partially demineralized bone. Results show that PPF wets easily, achieving 12.5% wt/wt in 30 min. Compressive tests on the PPF foam material showed that the compressive strength was 6.8 MPa prior to in vitro incubation but then gradually reduced to 1.9 MPa at 8 weeks. Push-out and pulloff strength tests showed that initially both PPF and PLGA foam coatings had comparable adherence strengths to the cortical bone samples (100-150 N). When additional geometrical surface alteration by perforation and demineralization of the bony substrate was employed, in vitro adherence of the PPF foam coating was further increased to 120 N, demonstrating a statistically significant improvement of push-out strength throughout the entire 8-week observation period ($p<0.0002$ for all four data points). The pore geometry of PPF-foam coatings changed little over the 2-month evaluation period. In comparison, PLGA foam coating around the cortical bone samples rapidly lost structure with a decrease of 67% in strength seen after 1-week in vitro incubation. These new types of bone allografts may be particularly useful where the use of other replacement materials is not feasible or practical.

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